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EFFECTS OF ELECTROMAGNETIC RADIATION ON THE STRUCTURE AND FUNCTION OF MALE REPRODUCTIVE ORGANS AND THEIR CORRECTION WITH IMMUNOTROPIC DRUGS (LITERATURE REVIEW)

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Annotation. *In this work the literature sources on the negative effects of magnetic fields of different frequencies and power on the testes, the epididymis of the testicles of human, rat and some animals were analyzed. In addition in this literature review the authors explored the use of some immunocorrective drugs, also their combinations in treatment of inflammatory diseases of the testicles and prostate in experiment and the clinic.*

Also authors identified the results of the effect on the genitals of human and animals by the another immunomodulating drug – echinaceae purpurea are absent in modern scientific literature and may be summarized in subsequent studies.

Key words: *electromagnetic radiation, electromagnetic field, testicle, epididymis, immunotropic drugs.*

Introduction. 13 - 19% couples of fertile age suffer from the absence of children. Recently, there has been a tendency for an increase in the number of infertile marriages, according to the data of the expatriates and the thinner age 8-20%. In the structure of infertile marriages 25-54% is a male factor. Among the infertile examined men, the presence of occupational harmful factors was noted in 31.5% of patients, which confirms the importance of the influence of the electromagnetic field (EMF) on the development of reproductive sexual disorders.

The purpose of the work was the systematization of literary sources which changes are reflected in different organs and systems of human and animals that occur after the action of the electromagnetic field of different radiation parameters on the male genital organs and genitals of some animals as well as the effect of immunomodulating drugs on them.

Results and discussions. According to this, the interest in studying the features of structural and functional changes of the male sexual system under the influence of EMF is growing. In the literature, there were shortcomings in the number of sources in which the effects of electromagnetic field of different frequencies on the structure and function of male sexual organs could be fully raised.

One of the essential indicators of the biological action of an electromagnetic field is condition of the genetic apparatus and generative function, because the effect of a long-acting factor can be manifested only in subsequent generations. The most sensitive to the modifying influence of environmental factors is the early period of development of the organism (from the moment of fertilization to birth), when the formation, growth and differentiation of tissues, organs and systems occur: the current factors often become limiting at this time [1]. Prolonged EMF action under certain conditions can cause disrupt of the reproductive function and genetic apparatus. Based on the experimental data it was established that an electric field with a voltage of 4 to 25 kV/m causes a disrupt of the reproductive capacity in rats, giving an unfavorable influence on the function of the testicles and ovaries.

The testicles of rats have a high sensitivity to irradiation in low frequency EMF that can be attributed "to the critical organs" in relation to the influence on the body of this new adverse factor by the components of the productive environment. Especially detected components of the spermatogenic epithelium are the most differentiated cell elements - spermatozoon. The degree of detected regressive tissue changes depends on the intensity of the field and the duration of the irradiation. Dumansky Y.D., Andrienko L.G. [2] conducted experimental studies by the experimental animals that were exposed to industrial frequency EMF that may occur in the operating area of transmission lines (transmission lines). The authors determined the morphological changes of the testicles during repeated influences of industrial frequency EMF at different periods of the ontogeny of human. Clinical and experimental studies have revealed the development of individual consequences of embryotoxic, gonadotoxic and teratogenic effects of EMF. EMF with a voltage of 1 to 5 kV/m in conditions prolonged continuous action, without causing sterility in the subjects, adversely affects the germ cells of females and males, in the embryogenesis and postnatal progeny development. Lundsberg L.S. didn't reveal correlation between the magnitude of electromagnetic field induction and the subsequent appearance of anomalies in the reproductive organs and the effect on male fertility have not been identified.

Budyanska E.M. [3] was studying the effect of video display terminals (VDT) on the hormonal status of their users. Hypersensitivity of the sexual steroid metabolic system to occupational stress was determined. Men that work on VDT, have manifest changes in the content and ratio of sexual steroids - decreasing testosterone level and increasing estradiol level.

N.V. Kokoreva, T.A.Chuvpilo [4] testify the changes in the testicles because of the influence of a constant magnetic field (CMF). These changes are characterized by sperm damage in the tubules, the number of his spermatozoa, increased sperm anomalies. Cytological analysis of the spermatogenic epithelium of mice under the action of CMF induction of 0.4 and 1.6 Tl showed a decrease in the number of all cell types of spermatogenic epithelium by 35-40%, with the most pronounced changes observed from the mature forms of sperm. After short-term effects, the recovery process ended up to 40 days, after chronic effects it was longer. The authors may suggest that the reproductive function of the males is impaired by the effect of the CMF.

The Chernobyl disaster has led to significant damage to the immune system of the victims. As a result of the accident, about $1.1 \cdot 10^{19}$ becquerels of radionuclides were emitted into the environment, leading to radioactive contamination of the territory of Ukraine. Currently, the main pollution of the territory of country is determined by cesium-137 and to a lesser extent - strontium 90. Transuranium elements of Chernobyl origin are distributed almost all over Ukraine [5; 6]. However, according to departmental statistics 1999-2003, there was no increase in the frequency of unauthorized miscarriages up to 12 weeks of pregnancy, which mainly occur as a result of chromosomal abnormalities of the mothers, living in radioactively polluted territories [7].

I.D. Kirpatovsky, S.S. Pisarenko [8] have conducted a morphological examination of the testicles of 41 men, who were residing throughout 7-9 years in radiation contamination zones in the Kaluga region after the Chernobyl accident, found changes in the seed canals of varying degrees of severity in 75.6% of cases. Different degree of complexity of changes of gonads is revealed at men of different age. Male germ cells are more sensitive to ionizing radiation. Irradiation with a relatively low intensity of 0.15 Sv can cause transient azoospermia. Full sterility in 100% of men will develop with single exposure at a dose of 63 and above.

Bandazhevsky Y.I. [9] in 2011 was investigated that for a long time (1.3 and 6 months) after of the irradiation of male rats at a dose of 3 Gr, the content of sperm in the epididymis of the testicles, the content of nucleic acids and protein in the testes were decreased. The fertility of animals significantly reduced.

The dependence of the degree of lesion of the seed epithelium on the dose and power of irradiation is established. The degree of damaging germinative tissue increasing as the dose was accumulated, but this dependence was not linear. The predominant effect of the dose rate on the lesion processes was noted in the early days of prolonged and chronic irradiation. Irradiation dose rate becomes paramount in the processes of damage of seed tissue as the duration of the radiation exposure increases. From literature sources it has shown that ionizing radiation leads to the development of an autonomous process in an irradiated organism, which is primarily directed against cells of radiosensitive organs. At the same time, it is known that the testicles are one of the radio-sensitive organs. The cells of the spermatogenic epithelium are themselves foreign to their own body and are protected by a special barrier. Damage of the latter is established at EMF action and at occurrence of pathological conditions as a result of which an autoimmune pathological process develops [10; 11].

The violation of the structures of the hematotesticular barrier and microcirculation is an important aspect in the process of the development of male infertility and sexual disorders. It is established that a harmful factor of all genesis (trauma, hypothermia, the effect of pollutants, etc.) leads to the development of ischemic changes, a disorder of microcirculation, which leads to a decrease in the total number of cells of the spermatogenic row and disorder of the processes of sperm differentiation [12].

The problem of male infertility becomes more relevant from year to year, since the parenchyma of the testes has been quite sensitive to the influence of environmental

factors [13]. According to authors of Ukraine, the average age of patients suffering from chronic urogenital pathology is up to 80%, ranged from 21 to 50 years, and up to 30 years from 40 to 60% [14].

The fact that inflammatory diseases of the genital organs (chronic prostatitis, vesiculitis and urethritis) occur mainly men of reproductive age, aggravates the medical and social significance of the problem, since the disease reduces the sexual function of men, and in some cases, leads to impaired fertility. Sexual maladaptation of a married couple survived by the sick mans and destroy the marriage opportunity [15]. Injection of infertility is an acute and chronic circulatory disorder in it because developing germ cells are very sensitive to hypoxia. Circulatory disorders in the testicles can occur with changes in temperature, the effect of EMF, varicocele, accompanying by circulatory hypoxia [16; 17].

In order to restore the structure and function of the male genital organs after the action of damaged factors, including EMF, various immunoregulatory agents are used in the medical practice of urologists and pediatric surgeons.

According to Belotsky S.M., Spivak N.Ya. these drugs can be either immune (immunoglobulins) or chemical or biological agents (corticosteroids, cytostatics, etc.) [18]. Efremenko E.A. [19] in 2018 investigated the medicinal properties of pumpkin seeds, extracts of which include in the composition of rectal suppositories that are used in the treatment of acute and chronic diseases of the prostate gland. According to the author, pumpkin seed extracts also have reparative, antispasmodic, antimicrobial and antiandrogenic properties.

Musica N.Ya. [20] in terms of scientific research that preparations based on a vegetable raw materials are perspective group for treatment of the male genital organs including inflammatory organs. Among the natural compounds a complex of biologically active substances (BAR), removed from the inflorescence of alder birch "Altabor", attracted the most attention of the author. The theoretical prerequisite for the development of the test substance was information about the properties of BAR, in particular, their reparative, anti-inflammatory and antioxidant effects. Substance "Altabor" does not make allergic, immunotoxic, locally irritant and gonadotoxic actions that are essential to improve the effectiveness of therapy for male genital diseases.

Pastukhova V.A. [21] in 2012 used an applied leaf extract of Ginkgo biloba and the drug inosine after influence on the male genital organs of action of the chronic hyperthermia. Morphological analysis of the structure of the internal male genital organs during the application of extract from Ginkgo biloba leaves shows the reducing the dyscirculatory disorders investigated organs, the depth of their damage. This drug prevents destruction all components of the hematotesticular barrier of the testicles.

Workers exposed to electromagnetic fields are more likely to have infertility. There are many herbal antibacterial and antispasmodic effect. Spore and remedies that are used to treat male infertility. There are plants that have a regulatory effect on the hormonal background. Such property has sage, which, among other things, still has anti-inflammatory and antiseptic action, helps in the treatment of prostatitis. Peony, like

sage, restores hormone levels and also regulates the nervous system. In some forms of infertility such herbs as plantain and spore are used. Plantain are still excellent in removing swelling [22].

There are herbs that can reduce the autoimmune processes in the testicles. These properties have a composition that combines plantain leaves, nettles, mothers-stepmothers, cranberries, birch buds, tansy flowers, oregano, yarrow, bird's mountaineering, goose fingerlings, marsh drought and dandelion root. For the treatment of male infertility, herbs can brew and drink tea made from goritzvit, Adam's root, sage, pine uterus, hawthorn and elder. Treatment is often based on the principle of general health promotion and restorative processes in the body.

Treatment of male infertility usually involves the use of various plant components, as well as bee products, which activate the body's natural functions. Sometimes honey, flower pollen, tincture of wax moth, mummy and propolis are used in combination with apple cider vinegar or carrot juice and medicinal plants. Bee products help with infertility as they contain many vitamins, microelements and acids. Bee products reduce inflammation, swelling and continue chronic remission diseases, immunity, soothe, heal, restore metabolism [23].

Treating the disease with herbal remedies will not help eliminate all the problems, as there are a number of points that require the use of medicines or even surgical treatment. But, nevertheless, these methods help in the basic therapy of infertility and perfectly restore the general health.

Biologically active additives are important for the treatment of diseases of the testicles and the reduction of potency. Reduced potency - the result of unhealthy nutrition, psycho-emotional overloads, hypodynamic lifestyle. To solve this delicate problem, there are many medicines. Unfortunately, most of them have a number of contraindications and side effects. Support the elimination of potency problems without disrupting the functionality of other organs and harming health, possibly through dietary supplements. The widespread use of dietary supplements is due to their natural composition. Potency boosters are designed based on natural components.

Biologically active supplements are made up of several ingredients that have a positive effect not only on the male potency, but comprehensively on the whole body. Supplements are developed on the basis of natural raw materials. Almost all products contain polyunsaturated fatty acids, which improve the quality of sperm, selenium and zinc, responsible for the production of testosterone, amino acids for endurance, vitamin complexes. Due to its natural composition, supplements for men are allowed to use for a long period of time with short breaks [24].

Due to its natural composition, supplements for men are allowed to use for a long period of time with short breaks. Supplements are not addictive and have no withdrawal syndrome. They can be taken to restore the functionality of the genitals, and to prevent problems with potency. In addition, biologically active supplements have a beneficial effect on the immune system, normalize sleep, increase the overall tone of the body.

Conclusions. Thus, in modern times, there is not such drug, that would completely

restore the structure and function of the human genital organs. The combination of some drugs can only improve the condition of these organs.

1. Many years of medical treatment shows that if the deviations and components of the phytocomposition are properly evaluated and corrected, then most of the disorders are corrected. This is probably due to duplication of pharmacological effects (using plants of the same directional effect), increasing the likelihood of induction of the main desired effect by indirect actions; utilization of the whole pharmacological potential of used medicinal plants (thousands of chemical compounds), full-scale use of multiple duplication of functions in the body.

2. The use of medicinal plants and preparations based on them for thousands of years confirms that the plant is a biogenetically formed complex, such a complex that exists in a living cell, is more similar to the human body than individual chemicals, and therefore easier to assimilate and give fewer side effects.

3. Treatment with medicinal plants immunomodulatory action indicates that the correct selection of components of the phyto composition increases the likelihood of achieving the main pharmacological effect.

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